

Sea Ice Thickness from SAR-derived Kinematics

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The RADARSAT synthetic aperture radar is currently providing repeat surveys of the Arctic Ocean sea ice on a near 3-day basis with its wide-swath ScanSAR mode. For the first time, we can produce basin-scale estimates of sea ice age and thickness from observations of ice motion derived from sequential SAR images of the Arctic Ocean. The direct observations we extract from the SAR imagery are the deformation of Lagrangian elements (cells) which are areas enclosed by polygons defined by vertices on the ice cover. The time-dependent deformation of these cells are computed from the motion of the vertices obtained by tracking these points in SAR imagery. From the record of deformation, we estimate the ice age and thickness within each of these cells. Each cell covers an initial area of approximately 10 km by 10 km. More than 60,000 of cells are used to cover the entire Arctic Ocean. These high-resolution observations give us an unprecedented view of the sea ice cover and are suitable for supporting polar investigations as well as operational applications.

We have produced estimates of sea ice deformation, thickness and age from one entire winter of SAR maps of the Arctic Ocean from early November 1996 through June 1997. We are also producing results from the winter of 1997-1998 and the summers of 1997 and 1998. Here, we describe this dataset, their use for studies of the sea ice cover and the potential contribution of ENVISAT in helping to extend these observations into the future. These data products and a description of their format are available at a website at the Jet Propulsion Laboratory (<http://www-radar.jpl.nasa.gov/rgps>).